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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS & INTERFERENCES

Serial No.: 10/671,555

Group Art Unit: 1754

Inventors: Marrella et al.

Filed: 9/29/2003

Title: PROCESS STREAM CONDENSATE RECYCLE METHOD FOR A STEAM REFORMER

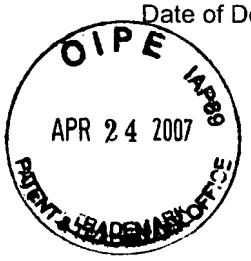
Examiner: P. A. Wartalowicz

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is a brief in support of an appeal from the decision of the Examiner dated October 17, 2006. A notice of appeal was filed on January 18, 2007 together with a one-month extension of time.



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I. REAL PARTY IN INTEREST

The real party in interest is Praxair Technology, Inc., the assignee of record.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences that have a direct affect or are directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Applicants appeal the rejection of claims 1-8 inclusive and all are involved in this Appeal Brief.

Claims 1-8 are all pending and stand rejected and the status of each claim is as follows:

Claim 1: Rejected

Claim 2: Rejected

Claim 3: Rejected

Claim 4: Rejected

Claim 5: Rejected

Claim 6: Rejected

Claim 7: Rejected

Claim 8: Rejected

IV. STATUS OF AMENDMENTS

All amendments that have been filed in this case have been entered and there are no outstanding amendments.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention, as recited in claim 1 is a method of recycling process stream condensate from a steam methane reforming system 1 illustrated in Fig. 1 and as set forth on page 7, lines 4-5, Paragraph 0019, produces an uncontaminated superheated steam stream 20 and at least one process condensate stream that in the embodiment illustrated in Fig. 1 are hot process condensate stream 30 and cold process condensate stream 36 as described on page 7, line 21 and 24-25, respectively, Paragraph 0020. Both of these streams are contaminated products to steam reformer 16 having been derived from water containing product stream 18 as mentioned on page 7, lines 19-20, Paragraph 0020.

With reference to Fig. 2, condensate is collected from a cold process condensate stream 36, the hot process condensate stream 30 and optionally an external process condensate stream 38, within a condensation collection drum 40 that are described on page 8, lines 5-8, Paragraph 0022. Contaminated condensate stream 44 is formed by the collection of condensate as set forth on page 8, lines 15-16, Paragraph 0022. As indicated on page 8, lines 23-26, Paragraph 0023, the contaminated condensate stream 44 is pressurized by a pump 46 to a pressure slightly above the pressure of the steam methane reforming process, typically between about 300 and 500 psig.

First part 60 of the uncontaminated superheated steam stream 20 produced in the steam production system 19 of steam methane reformer 16 is introduced into process steam superheater 56, a heat exchanger 57 and a boiler 50 to boil contaminated condensate stream 44 after having been pressurized and then passed through a condensate preheater 48 that preheats the condensate stream 44 after having been pressurized. In this regard, see page 9, lines 15-21, Paragraph 0025. As a result of this heat transfer, an uncontaminated condensate stream 26 is formed as indicated on page 9, lines 21-24, Paragraph 24. The passage of contaminated condensate stream 44 through condensate preheater 48, boiler 50 and steam superheater 56 forms a contaminated superheated steam stream 58 as described on page 9, lines 7-14, Paragraph 0024.

With brief reference to Fig. 4, in an alternative embodiment, in place of condensate preheater 48, boiler 50 and process steam superheater 52, a process steam boiler 76 can be provided to effectuate the heat exchange to produce contaminated superheated steam stream 58 and uncontaminated condensate stream 26. All of this is described on page 11, lines 8-12, Paragraph 11.

As indicated on page 9, lines 25-30, Paragraph 0026, a second part 62 of the uncontaminated superheated steam stream 20 is combined with the contaminated superheated steam stream 58 to form a combined superheated steam stream 12.

As set forth on page 9, lines 21-24, Paragraph 0025, the uncontaminated condensate stream 26 recycled to the steam production system 19 of steam methane reformer system 1. With reference again to Fig. 1, and as described on page 6, lines 27-30, Paragraph 0018, the combined superheated steam stream 12 is combined with a hydrocarbon containing stream 10 to form hydrocarbon and steam containing process stream 14 that is fed to the steam methane reformer 16.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following are concise statements of each ground of rejection presented for review:

i) Whether claims 1, 2, 4 and 8 are unpatentable under 35 U.S.C. §103(a) as being obvious over Schunck (GB 2 006 814) in view of Wasala et al. (U.S. 4,193,776) and Roensch (U.S. 4,464,228).

ii) Whether claim 3 is unpatentable under 35 U.S.C. §103(a) as being obvious over Schunck (GB 2 006 814) in view of Wasala et al. (U.S. 4,193,776) and Roensch (U.S. 4,464,228) and Tegge et al. (U.S. 3,642,731).

iii) Whether claim 5 is unpatentable under 35 U.S.C. §103(a) as being obvious over Schunck (GB 2 006 814) in view of Wasala et al. (U.S. 4,193,776) and Roensch (U.S. 4,464,228) and Erickson (U.S. 4,846,240).

iv) Whether claims 6 and 7 are unpatentable under 35 U.S.C. §103(a) as being obvious over Schunck (GB 2 006 814) in view of Wasala et al. (U.S. 4,193,776) and Roensch (U.S. 4,464,228) and Erickson (U.S. 4,846,240) and Dickinson (U.S. 4,377,066).

v) Whether claims 6 and 7 are unpatentable under 35 U.S.C. §103(a) as being obvious over Schunck (GB 2 006 814) in view of Wasala et al. (U.S. 4,193,776) and Roensch (U.S. 4,464,228) and Erickson (U.S. 4,846,240) and Drnevich (U.S. 2003/0110693).

VII. ARGUMENTS

A.) Claims 1, 2, 4 and 8 are not rendered obvious over Schunck GB 2 006 814 ("Schunck") in view of Wasala et al. U.S. 4,193,776 ("Wasala") and Roensch U.S. 4,464,228 ("Roensch")

A-1) The Examiner's Comments Appearing in the "Response to Arguments", Page 2 of the Instant Action, Do Not Meet The Initial Burden of the Examiner Establishing a Prima Facie Case of Obviousness.

Applicants' invention as recited in claim 1 is a method of recycling process stream condensate from a steam reforming system that includes the following elements:

i) a contaminated superheated steam stream is formed by superheating a pressurized contaminated condensate stream by transferring heat from a first part of an uncontaminated superheated steam stream to the pressurized contaminated condensate stream;

ii) the first part of the uncontaminated superheated steam stream is condensed to form an uncontaminated condensate stream;

iii) a second part of the uncontaminated superheated steam stream is combined with the contaminated superheated steam stream to form a combined superheated steam stream; and

iv) at least in part of the combined superheated stream is combined with a hydrocarbon containing stream to form a hydrocarbon steam containing process stream as a feed to the steam reformer. The uncontaminated condensate stream is recycled to the steam methane reforming system as make up.

The Examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. In order to establish a prima facie case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or combine reference teachings and the prior art references when combined must teach or suggest all claim limitations. The suggestion must be found in the prior art and not the disclosure of the application itself.

In the present examination, page 2, rather than making a prima facie case, the Examiner has improperly viewed a common element in the prior art in Applicants' invention, namely, a reactor feed containing uncontaminated steam, contaminated steam and a hydrocarbon to the exclusion of all other elements of the claim. In place of the required analysis, given this single element, the Examiner then concludes without any evidence that the claims are obvious. Put another way, the Examiner has presented no evidence that all elements of the claims are either found or suggested in the prior art. Here, what is stated is that, "The stream entering the steam reformer in the claimed invention comprises uncontaminated steam, contaminated steam, and a hydrocarbon stream; Schunck teaches a stream entering the reactor (3) comprising an uncontaminated steam, a contaminated steam, and a hydrocarbon stream. Because the resultant stream entering the reactor of the claimed invention is substantially similar to that of the resultant stream entering the reactor of the prior art, a patentable difference between the prior art of record and the invention claimed has not been established." The Examiner never adduces the remaining elements of the claims and as such, at least in this part of the rejection, does not present a case of obviousness to which Applicants can respond. Applicants submit that this part of the rejection can therefore have been seen as improper and having no basis in the law.

The remaining points in the "Response to Arguments" are contained in the more detailed rejection which will be responded to below. However, one further point that should be mentioned here is that Schunck, relied on in all of the rejections, was mentioned in the "Background" section of the instant specification. In connection with this reference, it is specifically stated that the present invention provides a method that inherently involves less expensive modifications to produce a feed to a reactor, namely, it does not require the use of contacting columns. This central advantage of the present invention is not in the prior art, let alone, Schunck along with the specific features of the invention set forth in the claims.

A-2) Claim 1 is not rendered obvious by the Schunck, Wasala and Roensch combination.

As indicated above, claim 1 calls for i) a contaminated superheated steam stream to be formed by superheating a pressurized contaminated condensate stream through heat transfer from a first part of an uncontaminated superheated steam stream to the pressurized contaminated condensate stream; ii) a second part of the uncontaminated superheated steam stream to be combined with the contaminated superheated steam stream to form a combined superheated steam stream; and iii) at least in part of the combined superheated stream to be combined with a hydrocarbon containing stream to form a hydrocarbon steam containing process stream as a feed to the steam reformer. None of these elements are disclosed or even remotely suggested by the Examiner's rejecting combination.

In Schunck, a contaminated condensate stream is collected in a separator 6 and is then preheated in a heat exchanger 16. The resultant preheated contaminated condensate stream is then combined with a column bottom stream of a moisturizer column 9 (a contacting column sought to be avoided by the present invention) and is then further heated within a heat exchanger 11. After preheating a stream, it is then further heated against an incoming natural gas stream 1 within a heat exchanger 15 and then used to saturate the incoming natural gas stream within moisturizer column 9. A natural gas and steam mixture is then superheated within a heat exchanger 17 and then combined with a second part of the uncontaminated steam stream as feed to the steam reformer 3. A first part of the superheated steam stream by such action is condensed and sent to a degasser 7.

The Examiner states in the rejection, page 8, that, "Schunck fails to teach...pressurizing the contaminated condensate stream and...using at least part of the combined superheated steam stream to form a hydrocarbon and steam containing process stream as a feed to the steam reformer." Applicants agree with this statement, but further submit that Schunck does not also teach superheating the resultant pressurized stream through heat transfer from a first part of the uncontaminated superheated steam stream to form a contaminated superheated steam stream. The Examiner's position on this point is expressed

on page 3 of the rejection in which it is stated that "The stream flowing from the moisturizing column to the reactor comprising hydrocarbon and contaminated stream is combined with an uncontaminated steam stream thus forming a combined superheated stream combined with a hydrocarbon stream." This part of the rejection is simply a reconstruction of the prior art prompted by the teachings of Applicants' invention and is in reality an improper hindsight rejection. Again, in Schunck, the condensate stream is heated by the first part of the uncontaminated superheated steam stream in a preheater 16, a heat exchanger 11. No contaminated superheated steam stream is formed by such action. The condensate is further heated by the incoming natural gas within heat exchanger 15 and then combined with the natural gas within moisturizer column 9. It is this combined natural gas and contaminated steam that is then heated by the first part of the first part of the uncontaminated superheated steam stream. Consequently, at the point where the uncontaminated steam stream of Schunck is combined, there no long exists a contaminated superheated steam stream for combination. In fact, it is the lack of such a teaching in Schunck that supports the Examiner's admission that there exists no use of at least "part of the combined superheated steam stream" because there is no contaminated superheated steam stream produced in Schunck that could be used to form a combined superheated steam stream in the first instance. This element of claim 1 is entirely missing from the Examiner's analysis and constitutes a central reason as to why claim 1 is not rendered obvious by the Examiner's rejecting combination.

In any event, the pressurizing of the contaminated condensate stream and the combining of the combined superheated steam stream with a hydrocarbon containing stream is not supplied by either the Wasala and Roench references. In this regard, there is no combined superheated steam stream formed in the first instance given the fact that there is no contaminated superheated steam stream in any of the references.

The Examiner has misinterpreted Roensch in that the Examiner states that it teaches a process for stripping volatile contaminants and that the stripped condensate is pumped for the purposes of transferring the condensate to other operating units where high quality water is advantageous. This is incorrect. In Roensch Fig. 3, the process condensate stream is stripped within

an evaporative stripping column to remove process contaminants and then combined with well water and sent to a demineralizer train. As indicated in Roensch, this combined stream may be pumped. However, the point that the Examiner is missing here is that in the present invention, the uncontaminated condensate is recirculated to the steam reforming system as make up. It has never been contaminated given that it has been formed by condensing a first part of the uncontaminated superheated steam stream for heat transfer to the contaminated condensate stream. Simply stated, Roensch is not suggestive of pumping or otherwise pressurizing a contaminated condensate stream in the first instance. It pumps uncontaminated condensate since the same has been "stripped".

The Examiner has also misinterpreted Wasala. Wasala teaches a process wherein process condensate is purified of contaminants by stripping the process condensate with process steam before it is used in a chemical process. This is entirely contrary to the teachings of Applicants' invention in which it is the contaminated process stream that is in fact utilized as a feed to the steam reformer rather than a purified stream. Consequently, a rejecting combination of Schunck, Wasala and Roensch could not make out a prima facie case of unpatentability with respect to claim 1.

A-3) Rejection of Claim 2

Claim 2 calls for stripping dissolved gasses out of the at least one process condensate stream in a stripping column and collecting the condensate as a column bottoms of the stripping column. However, this is not what is taught in Wasala as alleged by the Examiner. Rather, Wasala, teaches a process wherein process condensate is purified of contaminants by stripping the process condensate with a process stream before it is used in a chemical reaction. In Applicants' invention as recited in claim 1 it is the contaminated process stream that is in fact utilized as a feed to the steam methane reformer rather than a purified stream. Consequently, Wasala is not even remotely suggestive of stripping dissolved gases out of a process condensate stream that is contaminated in the first instance.

A-4) Rejection of Claim 4

Claim 4 calls for heat to be transferred from the first part of the uncontaminated superheated steam stream to the contaminated condensate stream, in sequence, in a process steam superheater, a boiler, and a condensate preheater so that the contaminated condensate stream is initially preheated in the condensate preheater, as boiled in the boiler and then is superheated in the process steam superheater. In Schunck the contaminated condensate stream is preheated in two heat exchangers namely, heat exchanger 16 and heat exchanger 11. It is thereafter heated into steam within a heat exchanger 15. The resultant mixture of steam and hydrocarbons is then heated within a heat exchanger 17. Consequently, Schunck does not meet the terms of Applicants' invention as recited in claim 4 let alone suggest the subject matter thereof.

A-5) Rejection of Claim 8

Claim 8 calls for the condensate to be collected by an external process condensate stream that is produced externally to the steam reformer in forming the contaminated condensate stream from the external process condensate stream. This is certainly not taught by Wasala that teaches a process wherein process condensate is purified of contaminates by stripping the process condensate with a process stream before it is used in a chemical process. In Wasala the process condensate does not combine with a process condensate stream produced from a reformer. There is no mention that the process condensate is imported from a hydrogen or other synthesis gas plant. Rather, for instance, in col. 2, lines 47-50 it is stated that the process condensate is from a hydrogen or other synthesis gas plant, after having been heated and stripped within a stripping tower. In the example in col. 3, condensate is heated and fed by a pipeline 6 to the top of stripping col. 1. The process condensate is then stripped of superheated steam flowing in pipe 11. There is no combination of two sources of the process stream as recited in claim 8. Consequently, claim 8 is likewise not rendered unpatentable by the Examiner's rejecting combination.

B.) Claim 3 is not rendered obvious under 35 U.S.C. §103(a) as being unpatentable over Schunck in view of Wasala and Roensch and Tegge et al. U.S. 3,642,731 ("Tegge")

Applicants' invention as recited in claim 3 calls for the process condensate to be collected in a collection drum. Here the Examiner has misconstrued the claim. In claim 1, discussed above the condensate is collected from at least one process condensate stream to form a contaminated condensate stream therefrom. Such process condensate is collected in a collection drum, for example, drum 40 shown in Fig. 2. The same holds true for Schunck in that the process condensate is collected within a drum 6. However, for reasons outlined above, the Schunck, Wasala, and the Roensch references do not teach the features of claim 1 and consequently, claim 3. In this regard, it is agreed that Tegge teaches a process for the production of polymers wherein a drum includes the collection portion for the purpose of collecting immiscible liquid to be drawn and pumped. However, this mere feature does not render Applicants' invention as recited in claim 3 unpatentable in which the process condensate is pumped and superheated with a first part of a superheated steam stream, combined with a second portion of the superheated steam stream and then further combined with a hydrocarbon steam to be fed into a steam methane reformer. None of these features are taught by Tegge.

C.) Claim 5 is not rendered unpatentable under 35 U.S.C. §103(a) as being unpatentable over Schunck (GB 2 006 814) in view of Wasala et al. (U.S. 4,193,776) and Roensch (U.S. 4,464,228) and Erickson (U.S. 4,846,240).

Claim 5 calls for heat to be transferred from the first part of the uncontaminated superheated steam stream to the contaminated condensate stream in a single plate and frame heat exchanger, for example, the heat exchanger shown in Fig. 4. Erickson teaches a process for compressing steam or other vapor in which low pressure steam is adsorbed in an aqueous absorbent solution to release heat. It has nothing do with transferring heat from an uncontaminated superheated steam stream to a contaminated condensate stream in a single plate and frame exchanger. While Erickson mentions that plate and frame heat exchangers may be used for such purposes, it does not

even remotely suggest the heat exchange process contemplated in claim 5. Consequently, here the Examiner is making another error of hindsight rejection in which he is picking and choosing features found in the prior art in isolation and combining such features in an attempt to meet the terms of Applicants' invention cited in the presently pending claims without any hint in the references to make any such combination.

D.) Claims 6 and 7 are not rendered unpatentable under 35 U.S.C. §103(a) over Schunck in view of Wasala and Roensch and Erickson and Dickinson U.S. 4,377,066 ("Dickinson")

Claim 6, that depends on claim 4 (steam superheater, boiler and condensate preheater used to transfer heat from the first part of the uncontaminated superheated steam stream to the contaminated condensate stream), calls for a third part of the uncontaminated superheated steam stream to be exported. Claim 7 has the same limitation as claim 6 except that it depends on claim 5 in which the heat is transferred from the first part of the uncontaminated superheated steam stream to the contaminated condensate stream in a plate frame heat exchanger.

As the Examiner mentions in the rejection, Schunck fails to teach the exporting of a third part of the uncontaminated superheated steam stream. Dickinson adds nothing that would render either claim 6 or claim 7 unpatentable. In Dickinson, make-up water is pumped in a pump 186 and then preheated in an exchanger 188. The make-up water then flows through a line 190 to combine with preheated condensate. The combined boiler feed water is then pressurized by pump 182 to cause it to flow through boiler feedwater exchanger 136 in which it is further heated and then introduced into a boiler 106. Heat from product gas converts part of the incoming water to steam. The resulting two phase mixture flows in a line 196 to a steam drum 198. In drum 198, steam separates and leaves through a mist extractor 199, which purifies the steam of entrained droplets on its way to steam superheater 90 where it leaves as a product from line 200. Hence, Dickinson shows the production of superheated steam for export, but does not disclose or suggest a third part of the uncontaminated superheated steam stream to be exported, the first and second part having been

used to form a hydrocarbon and steam feed to a reformer. Consequently Dickinson does not disclose nor is it suggestive of the invention set forth in claims 6 and 7.

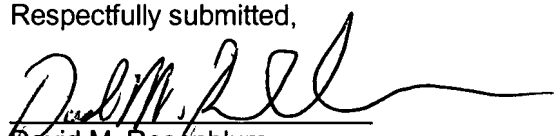
E.) Claims 6 and 7 are not rendered unpatentable under 35 U.S.C. §103(a) as being unpatentable over Schunck in view of Wasala and Roensch and Erickson and Drnevich U.S. 2003/0110693 ("Drnevich")

Applicants agree that Drnevich teaches a process of steam methane reforming wherein an export steam stream is exported from a steam methane reformer system. However, this is not a third part of the uncontaminated superheated steam stream as called for in claims 6 and 7, the first and second parts having been sequentially combined with contaminated steam and a hydrocarbon stream to form a feed to the steam methane reformer. In Drnevich, a first part 20 of uncontaminated steam stream 10 is combined with natural gas stream 8 to form a feed to steam methane reformer tubes 104. The second part 22 of uncontaminated steam stream 10 is exported. As such, there is no teaching or even a suggestion of a third part of the uncontaminated steam stream available for export as set forth in claims 6 and 7. Consequently, Applicants' invention as set forth in claims 6 and 7 is patentable over such rejecting combination of references.

VIII. CONCLUSION

In conclusion, Applicants request reconsideration and reversal of the rejections made in this case and allowance of all pending claims.

Respectfully submitted,



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EVIDENCE APPENDIX

None.

CLAIMS APPENDIX

1. A method of recycling process stream condensate from a steam reforming system that produces an uncontaminated superheated steam stream and at least one process condensate stream contaminated with products of a steam reformer of the steam reforming system, said method comprising:

collecting condensate from the at least one process condensate stream and forming a contaminated condensate stream therefrom;

pressurizing the contaminated condensate stream;

transferring heat from a first part of the uncontaminated superheated steam stream to the contaminated condensate stream, after having been pressurized, to form a contaminated superheated steam stream and to condense the first part of the uncontaminated superheated steam stream, thereby to form an uncontaminated condensate stream;

combining a second part of the uncontaminated superheated steam stream with the contaminated superheated steam stream to form a combined superheated steam stream;

recycling the uncontaminated condensate stream to the steam reforming system as make up for the uncontaminated superheated steam stream; and

combining at least part of the combined superheated steam stream with a hydrocarbon containing stream to form a hydrocarbon steam containing process stream as a feed to the steam reformer.

2. The method of claim 1, further comprising stripping dissolved gases out of the at least one process condensate stream in a stripping column and collecting the condensate as a column bottoms of the stripping column.

3. The method of claim 1, wherein the process condensate is collected in a collection drum.

4. The method of claim 2 or claim 3, wherein heat is transferred from the first part of the uncontaminated superheated steam stream to the contaminated condensate stream, in sequence, in a process steam superheater,

a boiler, and a condensate preheater so that the contaminated condensate stream is initially preheated in the condensate preheater, is boiled in the boiler, and is then superheated in the process steam superheater.

5. The method of claim 2 or claim 3, wherein heat is transferred from the first part of the uncontaminated superheated steam stream to the contaminated condensate stream in a single plate and frame heat exchanger.

6. The method of claim 4, wherein a third part of the uncontaminated superheated steam stream is exported.

7. The method of claim 5, wherein a third part of the uncontaminated superheated steam stream is exported.

8. The method of claim 1, further comprising collecting condensate from an external process condensate stream produced externally to the steam reformer and forming the contaminated condensate stream from the external process condensate stream and the at least one processes condensate stream.

RELATED PROCEEDINGS APPENDIX

None.